

Massive Bone Allografts in the Treatment of Pathologic Fractures Due to Bone Metastases

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Background and Objectives: Pathologic fractures due to disseminated metastases are common and often involve major long bones, where the metastasis is responsible for wide bone erosion that is equivalent to major bone loss. Stabilization of these fractures necessitates tumor excision and reconstruction of the destructive metastatic process.

Methods: Massive allografts were used either as intercalary or "composite" grafts (allografts and regular prostheses) in 17 patients.

Results: Fourteen patients could ambulate independently after surgery, and nursing of the remaining three became feasible and less painful.

Conclusion: In the event of pathologic fractures due to metastatic bone diseases associated with major bone involvement, massive bone allografts offer an inexpensive, adjustable, simple solution.

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KEY WORDS: bone; massive allograft; metastasis

INTRODUCTION

The treatment of patients with metastatic bone disease has become more frequent in orthopedic departments. Most patients with malignant tumors will have bone metastases at their demise, and often pathologic fractures are the presenting signs of disseminated disease.

A pathologic fracture in a patient with bone metastases may initiate clinical deterioration, leading to complications and death from causes unrelated to the primary disease.

Early stabilization of the fractures is, therefore, of utmost importance. Impending fractures, or even a fracture through a small-sized metastasis where cement and osteosynthesis are enough for stabilization, present relatively few orthopedic problems. Yet often these pathologic fractures are associated with wide involvement which, after excision of tumor tissue, is equivalent to major bone loss, usually when the bone defect is >5 cm in length. Reconstruction of this bone loss could be achieved by costly modular or custom-made prosthetics. Alternatively, massive bone allografts may be implemented and, in such devastating conditions, may offer a simple, biological and inexpensive solution. Bone allografts to reconstruct major bone loss due to metastatic

pathologic fracture can be used even as an immediate surgical intervention.

There are only a few reports in the orthopedic literature on the use of allografts in fractures with metastatic bone dissemination [1–4]. To the best of our knowledge, this is the first report on the use of massive bone allografts in the treatment of metastatic bone disease originating from the nonmusculoskeletal system.

MATERIALS AND METHODS

Seventeen patients, 13 females and 4 males aged between 36 and 81 years, who had suffered from pathologic fracture associated with extensive bone involvement and who were treated by massive bone allografts, were retrospectively evaluated. After surgery, they were followed-up for between 3 and 27 months.

The primary tumors were: breast, (nine patients); lung (three); kidney (two); prostate (one); and ovary (one).

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Fig. 1. Pathologic fracture of the proximal femur due to metastatic hypernephroma treated by massive allograft and long stem total hip arthroplasty (THA).

One patient presented with a metastatic adenocarcinoma of unknown origin.

The locations of the fractures and bone loss were: femur (13 patients; 4 proximal, 9 in the shaft); spine (1); and humerus (3).

All patients, with the exception of one, were known to be suffering from cancer, and were receiving treatment in the oncology department when the pathologic fracture with major bone involvement occurred. In the one patient pathologic fracture was the presenting symptom of the disseminated disease.

Stabilization and reconstruction of the fractures and associated bone loss were accomplished by bone allografts from the national bone bank, located at our hospital. The length of the cortical bone defect after excision of the tumor, ranged from 5–22 cm (average 10.8 cm).

In four cases a “composite graft” (allograft and hip prosthesis) was used (Fig. 1), whereas in the other 13, an intercalary allograft was used, augmented either by an intramedullary interlocked nail, or plate and screws (Fig. 2). Seven cases of fractured femur were treated by senior residents as an emergency surgical procedure.

RESULTS

Two cases developed wound infection: one was superficial (subsiding after antibiotic therapy) and the other was a chronic infection with a draining sinus, but no sign of allograft dissolution or rejection. In fact, to date there has been no necessity for removal or replacement of the allografts.

Fourteen patients resumed independent ambulation after surgery: three with a walker, two with crutches, five with a cane, and four unaided. In the remaining three,

nursing became feasible and painless. At the last follow-up (December, 1996), seven patients were still living and receiving oncologic treatment for their primary disease. Five of the patients were independently ambulant, and the remaining two were being nursed. The average time from surgery to death among the 10 deceased patients was 18 months (range 4–27 months).

Interestingly, on repeat X-rays of some patients, there were signs of tumoral expansion in most of the affected bone, while the allograft remained intact and presumably tumor free (Fig. 3).

DISCUSSION

Pathologic fractures, especially those of weight-bearing long bones, are often a clinical, as well as psychological “catastrophe” to cancer patients and their relatives. The treatment of these fractures, especially those associated with major bone involvement, is a surgical and humanitarian challenge to the orthopedic surgeon facing these situations [5,6].

Because most of our treatment is of patients with recognized oncologic disorders and with limited life expectancies, the therapeutic attitude should differ from that of primary bone tumor. The aims of treatment are to achieve stable fixation that will provide the patient with a better quality of life for whatever time remains before death, or at least to enable less painful nursing. Radiation in these circumstances is not efficient, because the major problem is a mechanical, segmental defect in the affected bone.

Over the last 20 years the use of various types of bone allografts has been widely reported in the orthopedic literature in relation to primary bone tumors [7,8]. Improved oncologic treatments have resulted in prolonga-

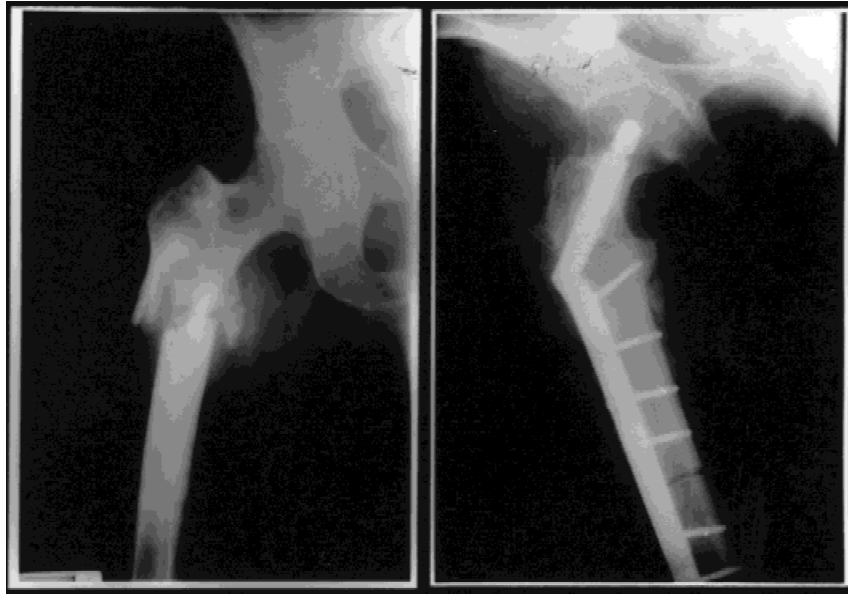


Fig. 2. Intercalary allograft augmented by nail plate for pathologic fracture due to breast carcinoma.



Fig. 3. "Sparing" of the allograft in a 36-year-old woman with advanced breast carcinoma.

tion of life for patients with various malignant diseases. Consequently, there has been an increase in the number of patients with metastatic disease and pathologic fractures who have limited, yet reasonable, life expectancy.

With the increasing cost of medicine, the solution to the growing numbers of such patients should address not only the medical difficulties, but also the economic aspects.

Whereas modular, or "custom-made" prosthetics are very expensive, bone allografts are inexpensive, simple, and easy to use, in the event of pathologic fractures associated with major bone involvement. The satisfactory

results of their use in these conditions, as shown in our study, may preserve the limited, yet precious, quality of life of cancer patients.

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